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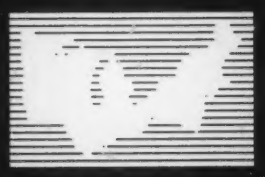
Northeast-Midwest Report



Northeast-Midwest Institute
The Center for Regional Policy

The Northeast-Midwest Institute was formed in 1977 at the request of representatives and senators who wanted to ensure the future economic vitality of those states that historically have formed the nation's industrial heartland. The Institute works closely with the Northeast-Midwest Congressional Coalition, a bipartisan group of nearly 200 representatives, and with the 36 senators who comprise the Northeast-Midwest Senate Coalition. In addition to elected officials, the Institute provides information and analysis to corporate, academic, and labor leaders who recognize the common problems facing their states and the fact that federal policies often create obstacles to regional economic growth. Institute staff work in five major issue areas: economic development, human resources, energy, natural resources, and trade.

FINANCING ACID RAIN CONTROLS THROUGH NATIONAL COST SHARING

Prepared for the

Northeast-Midwest Congressional Coalition

March 1988

Wesley Warren
Northeast-Midwest Institute
218 D Street, S.E.
Washington, D.C. 20003
(202) 544-5200

NORTHEAST-MIDWEST CONGRESSIONAL COALITION
NORTHEAST-MIDWEST SENATE COALITION
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In late 1976, members of Congress from the region founded the Northeast-Midwest Congressional Coalition in recognition of the common problems facing their states and the fact that federal policies often create major obstacles to regional economic growth. The bipartisan group now includes nearly 200 members of the House of Representatives. The Northeast-Midwest Senate Coalition, which was formed in 1978, has 36 members. Together the Coalitions seek to inform their members about the regional implications of national policies and proposals, and to influence those issues of greatest importance to Northeastern and Midwestern states.

The Coalitions propose legislative solutions to the economic problems of the New England, Mid-Atlantic, and Midwest states, and work to assure that federal policies are equitable in their treatment of different areas of the country. Task forces help develop policy initiatives and positions on subjects ranging from the federal budget and economic development to defense, natural resources, energy, and transportation.

The Northeast-Midwest Institute was formed in 1977 at the request of members of the House and Senate who perceived the need for information and analysis of public policies to identify and further the interests of the region. The Institute seeks to encourage policies that will ease the pressures on and support the continued revitalization of the region's economy. It continually searches for new ideas and legislative options that can help older Northern states overcome their handicaps--such as high energy costs and a deteriorating infrastructure--and prudently develop their many assets, including a highly skilled work force, top quality educational institutions, and abundant natural resources.

Although members of Congress remain key clients of the Institute, the organization has developed close working relationships with governors, mayors, and other state and local officials as well. The Institute's work is used widely and relied upon by corporate and labor leaders, academics, public interest groups, associations, and journalists throughout the nation.

The states in the region served by the three organizations are Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

Executive Summary

Each year utilities, industries, and motor vehicles emit millions of tons of sulfur oxides (SOx) and/or nitrogen oxides (NOx) into the atmosphere. These emissions are converted in the atmosphere into acidic compounds commonly called acid rain. According to a special envoys' report endorsed by the U.S. and Canada, acid rain threatens lakes, building materials, and possibly forests and human health. Acid rain controls, however, would be expensive, adversely affecting electricity rates and high-sulfur coal mining employment.

Controlling acid rain would benefit most parts of the country, either directly or indirectly. The Northeast would gain relief from damage to building materials and natural resources; Western low-sulfur coal producers could enjoy a boom in demand for their coal; Southern oil and gas states could capture a greater share of the utility market if old coal plants were retired early, or if fuel blending with natural gas increased. Most legislative proposals, however, would place most of the costs on one group of states, the Eastern coal region.

Much of the acid rain debate now hinges on finding the best method to pay for the cost of controls. One approach would establish a national fund to share the costs of installing pollution control equipment--an Acid Rain Superfund. Such a plan would need to combine a broad national fee with a subsidy for pollution control costs. If properly designed, this fund could control acid rain without placing a disproportionate economic burden on any one region.

This paper summarizes equity issues related to paying for acid rain controls. The first section provides background information on the regional aspects of acid rain control. The second section outlines the need for national financing of acid rain controls, with the following three arguments:

- economic policy--balancing economic growth between regions is a desirable national objective;
- energy policy--high-sulfur coal deserves federal support as part of a diverse national energy development strategy; and
- environmental policy--it is fair for regions to share the costs of pollution control in proportion to their contribution to the problem.

This paper's final section discusses proposals for financing acid rain controls. It considers the fairness and feasibility of the two most frequently discussed methods of financing--fees on the emission of air pollution and fees on the generation of electricity. Although either of these approaches could provide an effective way of financing controls, they need to be carefully designed to address the equity needs of the Eastern coal region.

The Political Geography of Acid Rain

The circumstances of geography often determine the perspectives that different groups have on acid rain. For purposes of this analysis, the United States has been divided into four geographic regions, according to the similarity of their interests in this debate:

- the Eastern coal region;
- the downwind North;
- the upwind South; and
- the West.

The Eastern coal region consists of the 11 states in the Eastern U.S. that used high-sulfur coal to produce over half of their electricity in 1985. Many of these states also produce high-sulfur coal either for their own use or for export to other states (see Table 1).

The remaining states in the Eastern U.S. divide roughly into those that are either upwind or downwind of the emissions from the coal region. There are 13 states in the downwind North and seven in the upwind South. For the most part, these states either mainly burn low-sulfur coal or rely on sources of fuel other than coal for electricity.

The West is composed of the 17 states west of the Mississippi River. These states produce most of their electricity from hydroelectric power plants or coal-fired units using low-sulfur coal. Alaska, Hawaii, and the District of Columbia have been omitted from this analysis.

Interests of the Eastern Coal Region

The Eastern coal region actually consists of two parts: the six major producers of high-sulfur coal (Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia) and five coal-consuming states (Alabama, Georgia, Maryland, Missouri, and Tennessee). The Eastern coal-producing region stands astride the two vast coal fields of the central U.S. and the Appalachian mountains. The coal-consuming states, encircling the coal-producing region, have easy and economical access to its deposits.

The economies of the Eastern coal-consuming states have developed in close relationship to those of coal-producing states, yet their interests are not identical. The coal-producing states have a double concern about the impact of acid rain controls, because they both produce and consume large amounts of high-sulfur coal. The Eastern coal-consuming states may be more interested simply in minimizing the costs of compliance and therefore may be less concerned about the effects of controls on coal producers.

Regional Divisions Based on High-Sulfur Coal Use and Location of Deposition Sites

Current Control Methods

Emissions of SOx can be controlled either by changing to a cleaner fuel or using a control technology. The main technology currently available for controlling SOx is a post-combustion device known as a scrubber. Although scrubbers can achieve high rates of sulfur removal (greater than 90 percent), they can be expensive and cannot remove NOx.[1]

The main alternative to scrubbing plants is switching to a cleaner fuel such as low-sulfur coal. Although switching to low-sulfur coal is generally less expensive than scrubbing, it would result in a shift of production and employment away from high-sulfur coal to low-sulfur coal areas. Switching would adversely affect the Eastern high-sulfur coal region, especially the states of Illinois, Indiana, Ohio, and Pennsylvania. In addition, coal switching, like scrubbing, is incapable of controlling NOx.[2]

New, clean coal technologies offer a promising third possibility that may be able to control both SOx and NOx at costs well below those of scrubbers. Clean coal technologies include a wide variety of methods to control emissions before, during, and after combustion, such as advanced physical coal cleaning, limestone injection multistage burners (LIMB), and in-duct sorbent injection. Because the research and development of many of these technologies is not yet complete, the special envoys' report recommended the establishment of a $2.5 billion, five-year program to demonstrate the commercial reliability of these technologies.[3]

Legislative Approaches

The two main considerations for acid rain controls will be what compliance strategy should be used, and who should pay for the costs. The principal compliance strategies are either "freedom of choice" or "forced scrubbing." Under forced scrubbing, utilities would be required to use technology to control emissions. This approach would protect the high-sulfur coal industry, but would increase control costs by restricting utility decision-making. Freedom of choice would allow utilities to select a control method.

Costs could be financed either through a national cost-sharing program or by the individual industry or utility. The latter approach, known as "polluter pays," has an immediate appeal but overlooks certain complex economic relations. If a polluter-pays plan were combined with a freedom-of-choice plan, then utilities would often switch to low-sulfur fuels. In this case, it would not be the polluter who pays, but rather it would be the coal miners and workers in related industries who pay by losing their jobs.

National cost-sharing, on the other hand, has the virtue of preventing the economic costs of a clean environment from being too burdensome on one group or region. It is the financing approach currently taken under several other major environmental programs, such as Superfund and the Clean Water Act.

Overall, combining freedom of choice with national cost-sharing may be the most desirable approach for the Eastern coal region. By reducing to utilities the cost of using control technologies, this approach offers some protection to the high-sulfur coal industry. At the same time, it allows utilities to choose the least expensive control method on a case-by-case basis.

Legislative Proposals

	National Cost-Sharing:	Polluter Pays:
Freedom of Choice:	Protects Eastern coal, and gives utilities flexibility	Gives utilities flexibility but affects Eastern coal
Forced Scrubbing:	Protects Eastern coal, but restricts utility flexibility	

Equity and National Cost-Sharing

Federal financial assistance often is provided as a way to help solve a major social problem, even though the principal beneficiary may be limited to a particular sector of the economy or region of the country. Examples of federal cost-sharing in the energy and environment area include sewer construction grants, hydroelectric development, and cleanup of toxic waste sites.

Although acid rain is often perceived as a problem limited to one part of the country, it is in many ways no different than these other energy and environmental issues. Furthermore, solutions to environmental problems that cross interstate and international boundaries often require national approaches to be successful. In fact, what may be necessary to achieve consensus on the acid rain question is the creation of an Acid Rain Superfund.

The Need for National Cost Sharing

The justification for national cost-sharing in the case of acid rain derives from special needs of the Eastern coal region and the disproportionate burden that controls would place on it. This paper will review the following three equity arguments advanced to justify national cost-sharing.

Balanced Economic Policy

National prosperity is strengthened by balancing economic growth in the different parts of the country. Controlling acid rain would be a significant expense for the Eastern coal region. Unfortunately, many of the states in this region have a limited ability to pay for controls because of high unemployment and restricted economic growth. National cost-sharing would prevent this region from having to bear all of these costs.

Sound Energy Policy

Sound national energy policy depends upon the development of a variety of reliable sources of energy. Although coal provides over half the country's electricity, greater federal support often goes to developing electricity from other sources. Since controlling acid rain could alter the economics of using coal-fired electricity, it would be a reasonable national policy to preserve the use of coal by sharing the costs of using it cleanly.

Fair Environmental Policy

Acid rain is not simply an issue between the Northeast and the Midwest, but is a national problem. Regions other than the Northeast (including the Midwest) are susceptible to damage from acid, and regions outside the Midwest contribute to the problem. However, many proposals would require the Eastern Coal region to control a greater proportion of emissions than they contribute to the national total. If the Eastern Coal region is required to control a disproportionate share of emissions, then they should receive national cost-sharing to help pay for their higher costs.

Regional Ability to Pay for Controls

Economic conditions should not be used as an excuse for a particular part of the country to avoid responsible environmental action, especially when it affects other parts of the country. Nevertheless, relative ability to pay for controls should be taken into account in the distribution of program costs.

Relative Costs of Controls

Two typical proposals for controlling acid rain are represented by H.R. 4567 from the 99th Congress and S. 321 from the 100th Congress. H.R. 4567 would require a 10-million ton reduction in SOx in 10 years, whereas S. 321 would require a 12-million ton reduction.

The Congressional Budget Office (CBO) has estimated that national costs of compliance with H.R. 4567 for utilities would be $2.6 billion annually, while the national costs of S. 321 would be $7.2 billion. Although the national costs of compliance with these different proposals would vary greatly, calculations by the Northeast-Midwest Institute indicate that the costs of compliance for the Eastern coal region would be about 69 percent of the national total. The four Northeast-Midwest coal states of Illinois, Indiana, Ohio, and Pennsylvania would pay $1.2 billion under H.R. 4567 and $2.3 billion under S. 321.

The CBO estimate for H.R. 4567 assumes that power plants would comply mainly by switching to low-sulfur coal, and therefore does not include the additional loss of income and employment in the high-sulfur coal mining industry. Although using conventional control technologies would reduce the impact of controls on the Eastern high-sulfur coal region, they would entail even higher costs for utilities than would fuel switching.

Cost to Utilities of Controlling Sox
(in millions of dollars)

Region	H.R. 4567 (1995)	S. 321 (2000)
Eastern Coal	1,753	4,945
Downwind North	127	846
Upwind South	414	913
West	257	477
U.S. Total	2,551	7,181

SOURCE: For H.R. 4567, see Congressional Budget Office, Curbing Acid Rain (Washington, D.C., June 1986), pp. 130-131; for S. 321 see Congressional Budget Office, Title II of the Proposed Senate Amendments to the Clean Air Act: a Preliminary Economic Analysis, staff working paper, September 1987, Table 3.

Economic Condition of the Eastern Coal Region

The Eastern coal region is very concerned about the effect of permanently higher energy costs on its industrial base. Retaining manufacturing jobs has become a major problem for this region. Between 1979 and 1984, while the U.S. lost 8.2 percent of its manufacturing employment, many of these states lost jobs at a much greater rate: Illinois lost 22.5 percent; Pennsylvania, 19.3 percent; Ohio, 18.6 percent; and Indiana, 15.3 percent.[4]

Overall, the Eastern coal region has less favorable economic conditions than the national average. The sluggish economic performance of this region is reflected in statistics for new capital expenditures since the Clean Air Act was last reauthorized. The true impact of pollution control expenditures has to be considered in terms of capital investment diverted from other activities. In 1985, new capital expenditures for all purposes in Illinois, Indiana, Ohio, and Pennsylvania totaled only $20.3 billion.

New Capital Expenditures

Region	1977 (in millions of dollars)	1985 (in millions of dollars)	Change 1977-1985 (in percent)
Eastern Coal	15,664	26,044	65.6
Downwind North	12,345	23,360	90.2
Upwind South	6,838	11,948	75.0
West	12,459	21,530	70.6
U.S. Total	47,459	83,132	75.0

SOURCE: U.S. Department of Commerce, Bureau of the Census, Annual Survey of Manufacturers 1985 (Washington, D.C., 1985).

Growth of Coal-Fired Electricity Generation

The slower rate of economic growth in the Eastern coal region outlined in the previous section correlates with its dependence for electricity upon old power plants built before New Source Performance Standards. Between 1977 and 1985, total U.S. coal-fired electricity generation increased by 42 percent. Although the Eastern coal region possessed two-thirds of total coal-fired electricity capacity in 1977, it accounted for only one-fourth of the increase in new coal-fired capacity between 1977 and 1985. The rate of growth in the upwind South and the West far exceeded the national average, with expansion in the West exceeding the Eastern coal region in absolute terms.

Furthermore, the South and the West are planning to add much more new, coal-fired electricity capacity than the Eastern coal region in the next decade. Thus, the regional distribution of emissions is likely to shift more towards the South and the West in the future (see Table 2).

Net Coal-Fired Electricity Generation, 1977-1985
(thousands of gigawatt hours)

Region	1977	1985	Change 1977-1985	Change 1977-1985 (in percent)
Eastern Coal	640.2	748.4	108.2	20.5
Downwind North	106.8	147.4	40.6	38.1
Upwind South	98.0	176.3	78.3	79.9
West	139.9	329.8	89.9	135.7
Total	984.9	1,401.8	416.9	42.3

SOURCE: Northeast-Midwest staff calculations from Department of Energy, Energy Information Administration, Electric Power Annual (Washington, D.C., November 1982), pp. 35-36; and Electric Power Annual 1985 (Washington, D.C., July 1986), pp. 17-18.

Federal Assistance for Electricity Development

Federal support for electricity development has made a valuable contribution to long-term electricity costs, but its benefits have not been evenly distributed. Historically, federal support for energy development has gone disproportionately to sources of electricity other than coal. Therefore, parts of the country that rely on other forms of electricity have often benefitted disproportionately from federal assistance. Past support has taken two main forms:

- direct financial assistance through subsidies, tax breaks, and funding for federal research and development; and
- direct financial assistance through federal power marketing authorities.

Direct Financial Assistance

Although federal funding for coal development has been substantial, generally it has lagged behind assistance to other conventional forms of energy when measured either in absolute terms or as a ratio of dollars spent to BTUs produced. In the past, funding levels for oil and gas, nuclear, and hydro projects in particular have been much higher.

A 1985 analysis of federal energy expenditures by the Center for Renewable Resources, which includes tax breaks as well as direct subsidies, shows spending for coal at the bottom of the list of conventional energy sources.[5]

Federal Expenditures on Energy Development in 1984

	Billions of Dollars Spent	Dollars per Million BTUs Produced
Nuclear	15.2	14.29
Hydro	2.3	2.00
Crude Oil	8.6	0.42
Natural Gas	4.6	0.26
Coal	4.0	0.17

SOURCE: The Center for Renewable Resources, The Hidden Costs of Energy (Washington, D.C., October, 1985).

Federal support for energy research and development programs, most of which comes from the Department of Energy (DOE), shows similar patterns. Funding for the coal portion of the Fossil Energy R&D program fell from $1.04 billion in fiscal 1981 to $203 million in fiscal 1987. By contrast, nuclear power averaged well over $1 billion a year during that period.[6]

In recent years, Congress has appropriated nearly $1 billion in funding for DOE's Clean Coal Technology Program (CCTP). However, establishment of the program was tied to the abolition of the controversial Synthetic Fuels Corporation, one of the original purposes of which was to expand the use of coal through commercialization of liquefied and gasified coal products. Therefore, even though expenditures on the CCTP have been significant, its creation was tied to a major cutback in overall funding for coal.

Power Marketing Authorities

Other regions have a major advantage over the Northeast-Midwest because of the existence of federally supported power marketing authorities (PMAs). PMAs conduct long-range electricity planning, and provide access to long-term loans from the federal government at below-market rates of interest. PMAs in the South, the Southwest, the West, and the Northwest have received substantial investments of federal monies over the years. The following table lists the outstanding debt owed to the federal government by PMAs according to the Congressional Research Service.[7]

Power Marketing Authority	Outstanding Debt to Federal Government (in billions of dollars)
Bonneville Power Authority (Northwest)	8.85
Southeastern Power Administration	1.38
Southwestern Power Administration	0.80
Western Power Administration	2.67
Total	13.70

Although some Southern coal states have benefitted from the existence of PMAs, the impact of these subsidies can be seen most dramatically in the case of hydroelectric development in the Northwest. The five states with the lowest electricity prices in the U.S.--Washington, Idaho, Montana, Oregon, and Wyoming--all have benefitted substantially from subsidized power.[8]

Need for Greater Federal Assistance for Coal

In the past, federal support for energy has tended to go to emerging sources of electricity, such as fission and fusion, or to the expansion of power generation in underdeveloped parts of the country. Therefore, states depending upon coal, a well established form of electricity, tended to receive less electricity development assistance than other parts of the country.

However, controlling acid rain currently presents a new kind of challenge to the continued use of high-sulfur coal. The amount of coal in the demonstrated reserve base of high-sulfur fields could supply current levels of U.S. coal consumption for the next 200 years.[9] Given the vast energy potential of this resource, federal assistance to help ensure that it can be used cleanly and cost-effectively represents a prudent investment in our energy future.

Regional Contribution to the Emissions Problem

The view that acid rain is strictly a problem between the Eastern coal region and the downwind North is being increasingly challenged. Recent surveys by EPA on levels of acidity in lakes and streams indicate that potential damage to water resources in the West and South is much greater than originally believed.[10] Evidence also exists that southern forests are suffering from the same kind of "dieback" being experienced to the north.[11]

Regional Proportion of Emissions

According to OTA figures for 1980, the Eastern coal region emitted 14.7 million tons of SOx, 55.6 percent of the national total. Not surprisingly, congressional proposals to control emissions would require the largest cuts in the Eastern coal region. Unfortunately for the Eastern coal region, most acid rain control proposals use an emission reduction formula that requires the region to reduce emissions by an even greater amount than the proportion of emissions they produce (see Tables 3 and 4).

According to these calculations, the Eastern coal region would be responsible for 81.6 percent and 80.0 percent of the national reductions in emissions under H.R. 4567 and S. 321 respectively--amounts that substantially exceed its contribution to total national emissions. Conversely, certain states that contribute a significant amount to total national emissions might have to make few reductions. For example, estimates based on data from Argonne National Laboratory indicates that about 30 percent of the total deposition of SOx in Iowa and Minnesota came from Western states in 1980.[12] Yet, most Western states would be required to make few reductions, if any, under most acid rain control proposals.

Level of Emissions of SOx and Emission Reductions Required Under H.R. 4567 and S. 321
(as percent of total)

Region	Emissions of SOx (1980)	Reductions Required H.R. 4567 (1995)	Reductions Required S. 321 (2000)
Eastern Coal	55.6	81.6	80.0
Downwind North	15.4	11.1	9.7
Upwind South	11.6	6.2	6.9
West	17.5	1.5	3.4
U.S. Total	100.0	100.0	100.0

SOURCES: Data on the emissions of SOx in 1980 and emission reduction required under H.R. 4567 from Office of Technology Assessment, "Analysis of a 1986 Acid Rain Control Proposal," April 9, 1986. Data on emission reductions required under S. 321 from Congressional Budget Office, Title II of the Proposed Senate Amendments to the Clean Air Act: A Preliminary Economic Analysis, staff working paper, September 1987.

Excess Emission Reductions in the Eastern Coal Region

If the only motive behind the distribution of emission reductions were environmental protection, then in theory, Congress could require all states to make the same percentage reduction in their emissions. On the face of it, a percentage reduction would be the most equitable approach--everyone would share the burden proportionally.

However, instead of using proportional reductions, most proposals rely on an "excess emissions" formula. An excess emissions formula would require each plant or state to eliminate its pollution above a certain rate of emission, for example, 1.2 pounds of SOx per million BTUs of energy input. Thus, states with low rates of emission are exempted from controls even if their total tonnage of emissions is quite large. As a result, an excess emissions formula allocates emission reductions to the Eastern coal region in greater proportion than their share of total national emissions.

Although one could argue that a proportional reduction would be fair theoretically, it has practical problems. One is that total national costs of compliance could increase because reductions would occur in states with low emission rates that have higher incremental cost of controls. Although the use of emissions trading would help to equalize the cost of controls, a proportional plan could still result in higher total costs of compliance.[13]

In addition, a proportional plan would have to be designed so that areas that already have reduced emissions would get full credit for past efforts. Credit for past effort could be assured by selecting a proper baseline for calculating emission reductions, such as 1970 when the Clean Air Act was originally created. Any reductions that had occurred since then would be automatically taken into account.

Unfortunately, although an excess emissions formula may be less expensive for the nation as a whole, it would shift a great deal of the costs to the Eastern coal region. This shift would create a disparity in the ratio of emissions-produced to emissions-reduced. The result would impose significant excess costs on the Eastern coal region.

Calculating Excess Costs of Compliance

"Excess cost" is the difference between what the Eastern coal region would have paid under a proportionate reduction, and what they would have to pay under an excess emissions formula. This excess cost of compliance can be roughly calculated by taking the difference between the level of reduction required under a proportional plan and the level required under an excess emissions formula, and multiplying the difference by the average cost of control. Therefore, the concept of a proportional reduction can be used to measure the degree to which the Eastern coal region may deserve assistance in paying for its costs of control.

According to this calculation, total costs shifted to the Eastern coal region from disproportional costs of compliance could be over $400 million a year for H.R. 4567 and nearly $1.3 billion a year for S.321. These figures suggest the amount of net funding from other regions that would have to be provided to the Eastern coal region, if it were to be compensated fully for reducing its emissions by a disproportionate amount.

Excess Costs of Compliance for Eastern Coal Region under H.R. 4567 in 1995

Emission Reduction under H.R. 4567	6,908 thousand tons SOx
Emission Reduction under Proportionate Plan	5,457 thousand tons SOx
Difference between H.R. 4567 and Proportional Plan	1,451 thousand tons SOx
Average Costs of Control under H.R. 4567	$299 per ton of SOx
Total Regional Excess Costs of Compliance (average annual costs times difference in emission reduction)	$434 million

SOURCE: Northeast-Midwest staff calculations from Congressional Budget Office, Curbing Acid Rain (Washington, D.C., June 1986).

Excess Costs of Compliance for Eastern Coal Region under S. 321 in 2000

Emission Reduction under S. 321	9,327 thousand tons SOx
Emission Reduction under Proportionate Plan	7,246 thousand tons SOx
Difference between S. 321 and Proportional Plan	2,081 thousand tons SOx
Average Costs of Control under S. 321	$616 per ton of SOx
Total Regional Excess Costs of Compliance (average annual costs times difference in emission reduction)	$1,282 million

SOURCE: Northeast-Midwest staff calculations from Congressional Budget Office, Title II of the Proposed Senate Amendments to the Clean Air Act: a Preliminary Economic Analysis, staff working paper (Washington, D.C., September 1987).

Funding a Control Program

This part of the paper initially examines how the federal government could subsidize the costs of controls. It then reviews the two main methods for financing the subsidy: a fee on the emission of air pollution, and a fee on the generation of electricity. Either approach could raise significant revenue, but they both should be designed to avoid placing a disproportionate burden on the region needing the greatest help--the Eastern coal region.

Some congressional proposals in the past have included national cost-sharing in their acid rain control programs. A national cost-sharing plan would have two parts--a fee and a subsidy. The net benefit to the Eastern coal region would be determined by the difference between the amount of the fee they have to pay and the amount of subsidies they receive. Based on the analysis in the previous section of the excess regional costs of controls under H.R. 4567 and S. 321, the net transfer of income to the Eastern coal region would need to be approximately between $400 million and $1.3 billion a year.

Use of a Subsidy

One way to share the costs of controls is to pay for a percentage of the costs of installing a pollution control technology. Fuel switching should not be provided with a subsidy because of the adverse effect that it would have on the high-sulfur coal industry. Since switching fuels is usually less expensive than using control technologies, the most efficient way to design a subsidy may be to pay for the difference in costs between switching and using a control technology, and then allow individual utilities to select the method of control they would prefer.

The most common subsidy proposal would have the federal government pay 90 percent of the capital costs of installation but none of the operating and maintenance costs. Since operating and maintenance costs can often be as expensive as the capital costs of controls over the life of the system, some proposals have included payment for part of these costs.[14]

Figures from CBO indicate that a subsidy could both help to protect the high-sulfur coal industry as well as reduce utility costs. For example, a subsidy that paid 90 percent of capital expenditures and 50 percent of operating and maintenance costs would save 37 million tons of annual coal production in Illinois, Indiana, Ohio, and Pennsylvania compared to a "polluter pays" approach that relied on coal switching.[15]

Method of Financing

If national cost-sharing is made part of an acid rain control program, Congress will have to select an appropriate financing mechanism. There are many different ways in which revenue could be raised to pay for controls. Most congressional proposals in the past have relied on fees either on the generation of electricity or the emission of SOx and NOx.

The way in which a fee should be designed depends upon the exact motive behind the fee. In general, a fee or tax is levied for one of three purposes:

- to raise revenue;
- to change behavior;
- to redistribute income or costs.

In tax theory, if a fee's only purpose is to raise revenue, then the fee should be neutral towards behavior or income distribution. In many cases, however, the need to raise revenue may be combined with one of the other purposes. For example, some policymakers may view taxes on cigarettes or alcohol as desirable since they might discourage unhealthy forms of consumption. Likewise, income taxes could be levied at a progressive rate, with wealthier people paying a greater percentage of their income as a way of assisting income redistribution.

Fees must be carefully designed to accomplish one purpose without contradicting another. For example, if fees designed to discourage a particular form of behavior were completely successful, then they would raise little revenue. Similarly, if progressive taxes seriously undermined work incentives, then revenue could decline. Finally, consumption taxes on cigarettes and alcohol could adversely affect income distribution if the poor spent a larger share of their income on these items than did the rich.

The remainder of this paper will consider the following financing methods as ways of addressing the equity concerns of the Eastern coal region:

- a fee on emissions; and
- a fee on the generation of electricity.

A Fee on Emissions

One way to raise revenue would be to place a fee on the quantity of pollution emitted by industries or utilities. Even a small fee on emissions could raise significant amounts of money. For example, CBO estimates that a $100 per ton tax on SOx emissions from utility sources could raise $18 billion over ten years.[16]

Furthermore, many supporters of this approach argue that emission fees also could cut pollution by giving industries and utilities a direct incentive to reduce emissions. However, an emissions fee large enough to change the behavior of a significant number of utilities would have to be quite substantial, perhaps between $300-$600 per ton of SOx a year. At that level, forms of pollution abatement such as switching or scrubbing would become less expensive than paying the fee.[17]

Depending upon the design of an emissions fee, the two very different motives of discouraging pollution and spreading costs can come into conflict. Since the Eastern coal region faces relatively high costs of compliance under

almost any acid rain control program, the most equitable plan would be one that redistributed costs nationally without disproportionately taxing that region.

Effect of Exemptions on Equity

An emission fee that charged the same amount of money on every pound of pollution, regardless of the rate at which it was emitted, would tax each state in proportion to its share of overall emissions. Under such a plan, the Eastern coal region would still pay more than any other region in absolute terms, but the amount it paid would be proportional to the amount it polluted. In this case, the redistribution of costs would be limited to the distribution of the subsidy.

On the other hand, many proposals for emission fees would exempt certain classes of emitters from paying the fee. The following exemptions not only could significantly lower emissions, but they also could shift much of the cost of the fee back to the Eastern coal region.

Exemptions by Source of Pollution. Because of the administrative difficulty of collecting fees from small industrial boilers or mobile sources, a fee might be limited to emissions from utility boilers. Since the Eastern coal region has a higher proportion of emissions from utilities and a lower proportion of emissions from industrial and mobile sources, the effect of such an exemption would be to place a greater portion of the tax on the Eastern coal region.

Exemptions by Kind of Pollutant. An emissions fee could also be limited to a particular pollutant, such as SOx; or different rates could be charged for different kinds of pollutants, for example, a higher rate for SOx than NOx. Again, this kind of exemption could have a significant effect on the regional incidence of the fee. Although the Eastern coal region is responsible for over one-half of the national emissions of SOx, it accounts for only one-third of the national emissions of NOx. Therefore, a fee that charged the same rate for emissions of SOx and NOx would be proportionally more favorable to the Eastern coal region than one which charged a lower rate for NOx (see Table 5).

	Regional Share of Total NOx Emissions, 1983	
	(thousands of tons)	(percent)
Eastern Coal	7,524	34.0
Downwind North	3,203	16.3
Upwind South	3,288	14.8
West	7,734	34.9
U.S. Total	22,161	100.0

SOURCE: Northeast-Midwest staff calculations from Environmental Protection Agency, National Emission Data System, 1983 National Emissions Report (Washington, D.C., December 1985).

Exemptions by Rate of Emission. Giving exemptions to units that emit pollution below a certain rate would also affect the equity of an emissions fee. Examples of such exemptions include excluding units from the fee that emit below 1.2 pounds per million BTUs or units that meet NSPS requirements. Again, because the Eastern coal region generally has older power plants with higher rates of pollution, exempting plants with low emission rates excludes a significant amount of pollution from taxation while increasing the amount of the tax on the Eastern coal states.

CBO studied the probable effect of a fee set to reduce annual emissions of SOx by 9 to 10 million tons a year by assessing pre-NSPS fossil-fuel facilities at a rate of $600 per ton of SOx. The Eastern coal region would pay more than 68 percent of such a fee, a much greater amount than the region contributed to total national emissions.

Proportion of National Emissions of SOx Compared to Incidence of an Emissions Fee Exempting NSPS Facilities

Region	Percent of National Emissions of SOx (1980)	Percent of Emissions Fee Excluding NSPS Facilities, 1985
Eastern Coal	55.6	68.3
Downwind North	15.4	16.7
Upwind South	11.6	9.2
West	17.5	5.9
U.S. Total	100.0	100.0

SOURCE: Northeast-Midwest staff calculations. Data on the emissions of SOx in 1980 from Office of Technology Assessment, "Analysis of a 1986 Acid Rain Control Proposal," April 9, 1986. Data on emissions fee from Congressional Budget Office, Curbing Acid Rain (Washington, D.C., June 1986) pp. 88-89.

A Fee on the Generation of Electricity

One frequently discussed method of funding controls is a fee on the generation of electricity. A fee of 1/2 mill per BTU on the generation of all domestically produced electricity would have raised $1,234 million in 1985, yet the charges would have amounted to less than one percent of the average U.S. electricity bill.

1985 Revenue from a 1/2 mill Electricity Fee by Source

Coal	$ 700 million
Oil & Gas	196 million
Nuclear	192 million
Hydro	140 million
Other	6 million
Total	$1,234 million

SOURCE: Northeast-Midwest staff calculations from Department of Energy, Energy Information Administration, Electric Power Annual 1985 (Washington, D.C., August, 1986), p. 10.

Several legislative proposals in the past have included this kind of fee. In the 98th Congress, electricity fees were in House acid rain control bills, H.R. 3400 and H.R. 4404. H.R. 3400 would have levied a 1 mill per kilowatt-hour fee to support a 10-million reduction in SOx. H.R. 4404 would have levied a fee of 1.5 mill per kilowatt-hour for a 12-million ton reduction.

Other precedents exist for an electricity fee. Nuclear power facilities pay a kilowatt-hour fee on generation into a nuclear waste disposal fund, and the Electric Power Research Institute collects a similar fee as dues from its members to support research on behalf of the utility industry.

Effect of Exemptions on Revenues

In the past, some members of Congress from regions relying on non-coal electricity generation have objected to paying electricity fees to support acid rain controls. As a result, exemptions for certain types of electricity have been offered as a way of gaining legislative support. However, exemptions of electricity can significantly reduce revenues by narrowing the rate base. Exempting all non-coal electricity generation from the fee would cause revenues to fall by over $500 million annually (see Table 6).

Effect of Exemptions on Equity

Since the Eastern coal region principally depends upon coal as a source of electricity, giving exemption to an electricity fee to non-coal sources of electricity would tend to shift the incidence of the tax back onto the Eastern coal region. Even small changes in the incidence of a fee can have an important effect one its equity. For example, in the case of a tax that raises a billion dollars a year, a change of one percentage point would shift $10 million in annual tax liability from one region to another (see Table 7).

The incidence of an electricity fee restricted to coal-fired generation would resemble that of a proportional emissions fee. It would therefore be limited in the degree to which it could spread the costs of control nationally. As in the case of a proportionate emissions fee, the redistribution of costs would be limited to the distribution of the subsidy.

Nuclear Power Exemption. Supporters of an exemption for nuclear power point out that nuclear power does not contribute to acid rain, and that the nuclear power industry currently pays an electricity generation fee to help pay for the costs of nuclear waste disposal. Furthermore, many of the Eastern coal states, such as Illinois, and Pennsylvania, rely upon nuclear power for much of their electricity that is not coal-fired. In states such as these, taxing nuclear power would actually impose an additional expense and little net benefit.

Oil and Gas Generation Exemption. In the past, many states dependent upon electricity from oil and gas combustion sought exemptions from an electricity fee on the grounds that oil and gas contribute very little to SOx emissions. Although it is true that oil and gas are responsible for fewer SOx emissions than coal, they do contribute significantly to the emissions of NOx. Furthermore, if acid rain controls are enacted, oil and gas could capture a greater share of the electricity market, especially since many restrictions under the Fuel Use Act have been repealed. A fee on oil and gas could help prevent this long-term shift away from coal.

Hydroelectric Exemption. As in the case with nuclear power, supporters of exemptions for hydroelectric power argue that it does not contribute to acid rain and therefore should be exempt from a fee. Although this claim is true, it overlooks the fact that substantial federal assistance has gone to the development of hydropower in the past.[18] Therefore, proponents of a broadly based electricity fee contend that it would be fair for recipients of federal assistance in the past to be willing to support federal assistance for coal development in the future.

Overall Effect of Exemptions on Equity

Exemptions can shift dramatically the regional impact of an acid rain control fee. Because exemptions narrow the rate base, they can shift the burden of the fee back onto the Eastern coal region, the very region that needs assistance the most. Policymakers, therefore, must design financing mechanisms carefully to ensure that they have a broad tax-base, if addressing the equity concerns of the Eastern coal region is a principal objective.

1985 Revenue from an 1/2 Mill Electricity Generation Fee
and Potential Losses from Exemptions
(millions of dollars)

Region	Fee on All Electricity	Potential Loss of Revenues from Exemptions				
		Nuclear	Hydro	Oil&Gas	Other	Total
Eastern Coal	440.2	-59.7	-12.8	-7.2	-0.1	-86.6
Downwind North	203.1	-53.5	-17.8	-44.4	-0.2	-109.3
Upwind South	182.8	-56.8	-5.7	-32.2	0.0	-94.7
West	403.4	-21.9	-103.8	-107.8	-5.0	-238.5
Total U.S.	1,229.4	-191.8	-140.2	-191.6	-5.3	-528.9

SOURCE: Northeast-Midwest staff calculations from Department of Energy, Energy Information Administration, Electric Power Annual 1985 (Washington, D.C., August, 1986), pp. 17-29.

Incidence of an Electricity Fee with Different Exemptions
(percent of national total)

Region	No Exemptions	Nuclear Exemption	Nuclear/Hydro Exemption	Nuclear/Hydro/Oil/Gas Exemption
Eastern Coal	35.8	36.7	41.0	51.5
Downwind North	16.5	14.4	14.7	12.4
Upwind South	14.9	12.1	13.1	12.6
West	32.8	36.8	31.0	23.5
U.S. Total	100.0	100.0	100.0	100.0

SOURCE: Northeast-Midwest staff calculations from Department of Energy, Energy Information Administration, Electric Power Annual 1985 (Washington, D.C., August, 1986), pp. 17-29.

Totals may not add due to independent rounding.

Conclusion

National cost-sharing has been used by the federal government as a way of solving natural resource problems as diverse as wastewater treatment, hydroelectric development, and toxic waste disposal. The use of national cost-sharing to control acid rain, through the creation of an Acid Rain Superfund, could help to protect the Eastern Coal region from the economic impact of controls in a fair and feasible fashion.

The justification for national cost-sharing for controlling acid rain stems from equity arguments in three areas:

- energy policy--coal deserves greater federal support as an energy resource than it has received in the past;
- economic policy--balancing economic growth between regions is a desirable national objective; and
- environmental policy--it is fair for regions to share the costs of pollution control in proportion to their contribution to the problem.

Because most acid rain proposals would require disproportionate costs of control from the Eastern coal region, national cost-sharing would help to spread these costs more equitably. Calculations by the Northeast-Midwest Institute indicate that leading House and Senate proposals would result in excess costs to the Eastern Coal region of between $400 million and $1.3 billion a year. These figures represent a rough estimation of the net transfer of money that should be made to the Eastern Coal region to address their equity concerns as acid rain controls are implemented.

A national cost-sharing plan would provide assistance through a fee and subsidy system. Ultimately, the net benefit to the Eastern Coal region would be determined by the difference between the amount of the subsidy they receive and the proportion of the fee that they pay. Therefore, it is important to know the proportions that each region would have to pay of a fee to determine the degree to which the fee and subsidy system as a whole achieves a net flow of income to the Eastern coal region.

The two principal ways of raising revenue are fees on air emissions and fees on the generation of electricity. Either method could be a reliable source of significant revenues for an acid rain control fund. However, their design can greatly affect the regional incidence of the fee and therefore the ability of the fee to spread the costs of control widely. In particular, the granting of exemptions, especially in the case of an emissions fee, can have the effect of shifting the cost of the fee onto the region that is in the greatest need of assistance. Overall, fees that are broadly-based would be the most beneficial to the Eastern coal region.

Footnotes

1. Larry Parker, Mitigating Acid Rain with Technology: Avoiding the Scrubbing-Switching Dilemma (Washington, D.C.: Congressional Research Service, June 1983), passim.

2. U.S. Congress, Congressional Budget Office, Curbing Acid Rain: Cost, Budget, and Coal-Market Effects (Washington, D.C., June 1986), pp. 29-40.

3. Drew Lewis and William Davis, Joint Report of the Special Envoys on Acid Rain (Washington, D.C., January 1986), pp. 6, 29-30.

4. Department of Labor, Bureau of Labor Statistics, Employment, Hours, and Earnings, States and Areas, 1939-82 (Washington, D.C., 1984); and Employment and Earnings, (Washington, D.C., May 1985).

5. It should be noted that conservation, a seriously neglected energy resource, could also make a significant contribution to controlling acid rain. See Howard S. Geller, et al., Acid Rain and Electricity Conservation (Washington, D.C.: Council for an Energy Efficient Economy, June 1987); and Ned Helme and Chris Neme, Acid Rain: Road to a Middleground Solution (Washington, D.C.: Center for Clean Air Policy, July 1987), pp. 96-97.

6. Unpublished budget data from the Department of Energy.

7. Alvin Kaufman and Donald Dulchinos, The Federal Power Marketing Administrations: to Privatize or Not to Privatize, (Washington, D.C.: Congressional Research Service, April 8, 1986).

8. Department of Energy, Energy Information Administration, State Energy and Expenditure Report 1984 (Washington, D.C., December 1986), p. xi.

9. Northeast-Midwest staff calculations from U.S. Department of Energy, Energy Information Administration, Coal Production 1985 (Washington, D.C., November 1986), p. 96.

10. Environmental Protection Agency, Western Lake Survey Phase I: Characteristics of Lakes in the Western United States (Washington, D.C., January 1987). See also World Resources Institute, The American West's Acid Rain Test (Washington, D.C., 1985), and Dan Whipple, "King Copper's Acid Reign," Sierra, v. 70, March/April 1985, pp. 16-20. For an opposing view, see Russell Erbes, "Acid Rain in the West: Separating Politics and Environmental Fact," Public Utilities Fortnightly, v. 115, May 16, 1985, pp. 17-20.

11. American Forestry Association, The Forest Effects of Air Pollution (Washington, D.C., November 19, 1987). William Hoffer, "Attack on our Eastern Forests," American Forests, v. 91, June 1985, pp. 17-19 and 58-59.

12. Northeast-Midwest staff calculations using unpublished data from Jack Shannon, National Argonne Laboratory.

13. An analysis by CBO of the pattern of emission reductions achieved through an emissions fee compared to that from an excess emissions formula suggest that the marginal cost of controlling emissions is in fact lower in the states with

the highest emission rates. CBO, Acid Rain, p. 75. See also Helms, Acid Rain, pp. 85-86.

14. One problem with subsidy plans that pay for a greater percentage of capital expenditures than operating and maintenance is that they could bias the choice of control technologies towards capital-intensive methods. The remedy for this problem would be to pay for equal percentages of both capital and operating and maintenance. Another alternate for a subsidy formula would be to offer a payment on the basis of a certain number of dollars per ton of pollutant removed.

15. CBO, Acid Rain, pp. xx-xxi. This calculation assumes a 10-million ton reduction in SOx.

16. CBO, Acid Rain, p 73.

17. These figures are based on the costs of control for an electric utility of either switching to low-sulfur coal or using a scrubber. For a survey of estimates on the relative costs of switching and scrubbing, see Wesley Warren, Acid Rain and the Condition of the Eastern High-Sulfur Coal Industry (Washington, D.C.: Northeast-Midwest Institute, September 1987), pp. 20-21.

18. U.S. Congress, House of Representatives, Committee on Government Operations, The Proposed Divestiture of the Power Marketing Administration: DOE Put the Cart Before the Horse, House Report 99-935 (Washington, D.C., October 1, 1986), p. 21.

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Table 1
Coal-Fired Electricity Generation
and Sulfur Content of Coal by State

Region	Percent of Total Electricity Provided by Coal	Average Sulfur Content of Coal by Weight[1]
Eastern Coal		
Alabama	70.7	1.5
Georgia	83.8	1.8
Illinois	60.8	1.9
Indiana	99.1	2.3
Kentucky	94.9	2.7
Maryland	54.5	1.4
Missouri	80.5	2.4
Ohio	97.5	2.5
Pennsylvania	74.1	2.1
Tennessee	75.4	1.9
West Virginia	99.2	1.8
Downwind North		
Connecticut	7.5	1.3
Delaware	69.4	1.0
Iowa	86.8	0.9
Maine	0.0	0.0
Massachusetts	27.0	1.2
Michigan	79.5	0.8
Minnesota	59.4	0.9
New Hampshire[2]	61.7	2.1
New Jersey	25.0	1.4
New York	16.8	1.9
Rhode Island	0.0	0.0
Vermont[3]	--	--
Wisconsin	67.2	1.1
Upwind South		
Arkansas	57.0	0.5
Florida	45.1	1.8
Louisiana	31.6	0.5
Mississippi	52.1	1.3
North Carolina	68.2	0.9
South Carolina	36.9	1.3
Virginia	42.3	0.9

Table 1 (continued)
Coal-Fired Electricity Generation
and Sulfur Content of Coal by State

Region	Percent of Total Electricity Provided by Coal	Average Sulfur Content of Coal by Weight[1]
West		
Arizona	60.4	0.5
California	0.0	0.0
Colorado	90.6	0.4
Idaho	0.0	0.0
Kansas	79.6	0.9
Montana	45.2	0.7
Nebraska	64.2	0.4
Nevada	69.5	0.5
New Mexico	89.7	0.7
North Dakota	90.0	0.7
Oklahoma	46.3	0.4
Oregon	1.2	0.3
South Dakota	3.2	0.9
Texas	44.9	0.6
Utah	92.2	0.5
Washington	8.5	0.9
Wyoming	96.6	0.5
U.S. Average	56.8	1.4

[1]For purposes of this study, high-sulfur coal is defined as coal with a sulfur content equalling or exceeding the national average of 1.4 percent.

[2]New Hampshire is counted as a downwind state because of recent passage of state acid rain control legislation.

[3]Small, non-zero number.

SOURCES: Northeast-Midwest Institute staff calculations from U.S. Department of Energy, Cost and Quality of Fuels for Electric Utility Plants 1985 (Washington, D.C., July 1986), pp. 69-72; and U.S. Department of Energy, Electric Power Annual 1985 (Washington, D.C., July 1986), pp. 17-18.

Table 2
Coal-Fired Electric Utility Operating Capacity, 1985, and Planned Capacity, 1995

Region	1985 Coal Operating Capacity (in gigawatts)	1995 Coal Planned Additions (in gigawatts)	Increase in Coal Capacity (in percent)
Eastern Coal			
Alabama	11.28	1.41	12.50
Georgia	12.78	1.64	12.83
Illinois	17.26	0.00	0.00
Indiana	20.11	1.57	7.81
Kentucky	15.60	1.90	12.18
Maryland	4.12	0.69	16.75
Missouri	11.68	0.65	5.57
Ohio	24.14	1.30	5.39
Pennsylvania	19.18	0.00	0.00
Tennessee	10.20	0.00	0.00
West Virginia	14.96	0.30	2.01
Total Eastern Coal	161.13	9.46	5.87
Downwind North			
Connecticut	0.40	0.00	0.00
Delaware	0.96	0.00	0.00
Iowa	6.43	0.00	0.00
Maine	0.00	0.00	9.00
Massachusetts	1.76	0.00	0.00
Michigan	13.02	0.03	0.23
Minnesota	5.12	0.94	18.36
New Hampshire	0.61	0.00	0.00
New Jersey	1.76	0.00	0.00
New York	3.28	0.00	0.00
Rhode Island	0.00	0.00	0.00
Vermont	0.01	0.00	0.00
Wisconsin	7.88	0.02	0.25
Total Downwind North	41.23	0.99	2.40
Upwind South			
Arkansas	3.76	0.00	0.00
Florida	8.93	1.78	19.93
Louisiana	3.57	0.00	0.00
Mississippi	2.20	0.00	0.00
North Carolina	12.56	0.74	5.89
South Carolina	5.32	1.09	20.49
Virginia	4.21	0.57	13.54
Total Upwind South	40.55	4.18	10.31

Table 2 (continued)
Coal-Fired Electric Utility Operating
Capacity, 1985, and Planned Capacity, 1995

Region	1985 Coal Operating Capacity (in gigawatts)	1995 Coal Planned Additions (in gigawatts)	Increase in Coal Capacity (in percent)
West			
Arizona	5.12	1.10	21.48
California	0.00	0.00	0.00
Colorado	4.98	0.84	16.87
Idaho	0.00	0.00	0.00
Kansas	5.60	0.00	0.00
Montana	2.51	0.00	0.00
Nebraska	3.12	0.00	0.00
Nevada	2.78	1.50	53.96
New Mexico	4.23	0.00	0.00
North Dakota	4.06	0.00	0.00
Oklahoma	4.69	0.52	11.09
Oregon	0.56	0.00	0.00
South Dakota	0.51	0.00	0.00
Texas	17.77	11.92	67.08
Utah	2.68	2.32	86.57
Washington	1.33	0.00	0.00
Wyoming	5.59	0.00	0.00
Total West	65.53	18.20	27.77
Eastern Coal	169.19	9.48	5.60
Downwind North	41.23	0.99	2.40
Upwind South	40.55	4.18	10.31
West	65.53	18.20	27.77
U.S. Total	316.50	32.85	10.38

SOURCE: Department of Energy, Energy Information Administration, Inventory of Power Plants in the United States 1985 (Washington, D.C., August 1986).

Table 3
Reduction in Emissions of SOx Required[1]
Under H.R. 4567 and S. 321
(in thousands of tons)

State	Emissions of SOx (1980)	Emission Reduction Under H.R. 4567 (1997)	Emission Reduction Under S. 321 (2000)
Eastern Coal			
Alabama	759	307	370
Georgia	840	480	735
Illinois	1,471	709	848
Indiana	2,008	1,173	1,446
Kentucky	1,121	726	434
Maryland	338	117	167
Missouri	1,301	887	857
Ohio	2,647	1,600	2,164
Pennsylvania	2,022	880	1,001
Tennessee	1,077	681	677
West Virginia	1,088	594	628
Total Eastern Coal	14,672	8,154	9,327
Downwind North			
Connecticut	72	0	0
Delaware	109	23	59
Iowa	329	126	147
Maine	95	1	0
Massachusetts	344	120	65
Michigan	907	251	159
Minnesota	260	59	178
New Hampshire	93	52	57
New Jersey	279	0	37
New York	944	137	89
Rhode Island	15	0	0
Vermont	7	0	2
Wisconsin	637	343	337
Total Downwind North	4,091	1,112	1,130
Upwind South			
Arkansas	102	10	21
Florida	1,095	299	358
Louisiana	304	0	15
Mississippi	285	30	87
North Carolina	602	139	186
South Carolina	326	101	69
Virginia	361	45	67
Total Upwind South	3,075	624	803

Table 3 (continued)
Reduction in Emissions of SOx Required[1]
Under H.R. 4567 and S. 321
(in thousands of tons)

State	Emissions of SOx (1980)	Emission Reduction Under H.R. 4567 (1997)	Emission Reduction Under S. 321 (2000)
West			
Arizona	900	0	7
California	446	0	0
Colorado	132	0	-2
Idaho	47	0	0
Kansas	223	23	25
Montana	164	0	30
Nebraska	75	0	11
Nevada	243	0	0
New Mexico	269	19	0
North Dakota	107	14	112
Oklahoma	121	0	29
Oregon	60	0	2
South Dakota	39	12	15
Texas	1,277	0	116
Utah	72	0	25
Washington	272	29	16
Wyoming	184	50	14
Total West	4,631	147	400
Eastern Coal	14,672	8,154	9,327
Downwind North	4,091	1,112	1,130
Upwind South	3,075	624	803
West	4,631	147	400
U.S. Total[2]	26,469	10,037	11,660

[1]Emission reductions based on bills as introduced into Congress and before amendments by committees.

[2]Totals may not add due to rounding.

SOURCE: Northeast-Midwest Institute staff calculations from U.S. Congress, Office of Technology Assessment, Analysis of a 1986 Acid Rain Control Proposal in Response to Congressman Henry Waxman, April 9, 1986; and Congressional Budget Office, Title II of the Proposed Senate Amendments to the Clean Air Act: a Preliminary Economic Analysis, staff working paper, September 1987.

Table 4
Reduction in Emissions of SOx Required[1]
Under H.R. 4567 and S. 321
(in percent of national total)

State	Emissions of SOx (1980)	Emission Reduction Under H.R. 4567 (1997)	Emission Reduction Under S. 321 (2000)
Eastern Coal			
Alabama	2.87	3.06	3.2
Georgia	3.17	4.78	6.3
Illinois	5.56	7.06	7.3
Indiana	7.58	11.69	12.4
Kentucky	4.23	7.23	3.7
Maryland	1.28	1.17	1.4
Missouri	4.91	8.84	7.3
Ohio	10.00	15.94	18.6
Pennsylvania	7.64	8.77	8.6
Tennessee	4.07	6.79	5.8
West Virginia	4.29	6.29	5.4
Total Eastern Coal	55.60	81.62	80.0
Downwind North			
Connecticut	0.27	0.00	0.0
Delaware	0.41	0.23	0.5
Iowa	1.24	1.26	1.3
Maine	0.36	0.01	0.0
Massachusetts	1.30	1.20	0.6
Michigan	3.43	2.50	1.4
Minnesota	0.98	0.59	1.5
New Hampshire	0.35	0.52	0.5
New Jersey	1.05	0.00	0.3
New York	3.56	1.37	0.8
Rhode Island	0.06	0.00	0.0
Vermont	0.03	0.00	0.0
Wisconsin	2.41	3.42	2.9
Total Downwind North	15.45	11.10	9.7
Upwind South			
Arkansas	0.39	0.10	0.2
Florida	4.14	2.98	3.1
Louisiana	1.15	0.00	0.1
Mississippi	1.08	0.30	0.7
North Carolina	2.27	1.39	1.6
South Carolina	1.23	1.01	0.6
Virginia	1.36	0.45	0.6
Total Upwind South	11.62	6.23	6.9

Table 4 (continued)
Reduction in Emissions of SOx Required[1]
Under H.R. 4567 and S. 321
(in percent of national total)

State	Emissions of SOx (1980)	Emission Reduction Under H.R. 4567 (1997)	Emission Reduction Under S. 321 (2000)
West			
Arizona	3.40	0.00	0.1
California	1.68	0.00	0.0
Colorado	0.50	0.00	0.0
Idaho	0.18	0.00	0.0
Kansas	0.84	0.23	0.2
Montana	0.62	0.00	0.3
Nebraska	0.28	0.00	0.1
Nevada	0.92	0.00	0.0
New Mexico	1.02	0.19	0.0
North Dakota	0.40	0.14	1.0
Oklahoma	0.46	0.00	0.3
Oregon	0.23	0.00	0.0
South Dakota	0.15	0.12	0.1
Texas	4.82	0.00	1.0
Utah	0.27	0.00	0.2
Washington	1.03	0.29	0.1
Wyoming	0.69	0.50	0.1
Total West	17.49	1.47	3.5
Eastern Coal	55.60	81.62	80.0
Downwind North	15.45	11.10	9.7
Upwind South	11.62	6.23	6.9
West	17.49	1.47	3.4
U.S. Total[2]	100.00	100.00	100.0

[1] Emission reductions based on bills as introduced into Congress and before amendments by committees.

[2] Totals may not add due to rounding.

SOURCE: Northeast-Midwest Institute staff calculations from U.S. Congress, Office of Technology Assessment, Analysis of a 1986 Acid Rain Control Proposal in Response to Congressman Henry Waxman, April 9, 1986; and Congressional Budget Office, Title II of the Proposed Senate Amendments to the Clean Air Act: a Preliminary Economic Analysis, staff working paper, September 1987.

Table 5
Emissions of NOx by State: 1983

	Tons of NOx	Percent of National Total
Eastern Coal		
Alabama	515,315	2.33
Georgia	587,363	2.65
Illinois	1,048,634	4.73
Indiana	828,607	3.74
Kentucky	506,375	2.28
Maryland	279,775	1.26
Missouri	580,152	2.62
Ohio	1,098,696	4.96
Pennsylvania	1,013,196	4.57
Tennessee	589,755	2.66
West Virginia	476,662	2.15
Total Eastern Coal	7,524,530	33.95
Downwind North		
Connecticut	140,161	0.63
Delaware	87,139	0.30
Iowa	308,008	1.39
Maine	68,595	0.31
Massachusetts	280,484	1.27
Michigan	664,984	3.00
Minnesota	361,558	1.63
New Hampshire	57,058	0.26
New Jersey	402,343	1.82
New York	777,673	3.51
Rhode Island	31,490	0.14
Vermont	23,243	0.10
Wisconsin	411,804	1.86
Total Downwind North	3,614,540	16.22
Upwind South		
Arkansas	263,435	1.19
Florida	720,427	3.25
Louisiana	903,385	4.08
Mississippi	257,474	1.16
North Carolina	537,051	2.42
South Carolina	249,323	1.13
Virginia	356,591	1.61
Total Upwind South	3,287,686	14.84

Table 5 (continued)
Emissions of NOx by State: 1983

	Tons of NOx	Percent of National Total
West		
Arizona	327,260	1.48
California	1,361,835	6.15
Colorado	309,315	1.40
Idaho	92,000	0.42
Kansas	432,839	1.95
Montana	123,601	0.56
Nebraska	196,980	0.89
Nevada	115,037	0.52
New Mexico	316,339	1.43
North Dakota	184,808	0.83
Oklahoma	486,130	2.19
Oregon	208,388	0.94
South Dakota	71,294	0.32
Texas	2,678,803	12.09
Utah	165,335	0.75
Washington	311,556	1.41
Wyoming	352,668	1.59
Total West	7,734,188	34.92
Eastern Coal	7,524,530	33.95
Downwind North	3,614,540	16.22
Upwind South	3,287,686	14.84
West	7,734,188	34.92
U.S. Total[1]	22,160,944	100.00

[1]Totals may not add due to rounding.

SOURCE: Environmental Protection Agency, National Emissions Data System, 1983 National Emissions Report (Washington, D.C., December 1985).

Table 6

Net Generation at Electric Utilities by Region Division, State and Fuel Type: 1985
(in gigawatthours)

Region Division and State	Coal-Fired Steam	Petroleum and Gas	Nuclear	Hydro-Electric	Other	Total Net Generation
Eastern Coal						
Alabama	51,375	118	14,313	6,862	-	72,667
Georgia	67,828	195	10,130	2,772	-	80,925
Illinois	62,983	1,458	39,106	119	-	103,667
Indiana	77,762	295	-	426	-	78,484
Kentucky	59,839	267	-	2,941	-	63,047
Maryland	17,613	3,222	9,926	1,524	16	32,300
Missouri	46,122	189	8,030	2,993	-	57,335
Ohio	108,029	351	1,943	175	265	110,763
Pennsylvania	99,995	7,822	26,232	971	-	135,018
Tennessee	50,242	128	9,672	6,539	-	66,581
West Virginia	78,905	263	-	368	-	79,536
Total Eastern Coal	693,028	14,308	119,352	25,690	281	880,323
Downwind North						
Connecticut	1,861	10,387	12,721	258	-	25,227
Delaware	5,866	2,604	-	-	-	8,470
Iowa	20,350	149	1,927	988	60	23,474
Maine	-	2,063	5,354	1,718	-	9,136
Massachusetts	10,577	19,350	6,133	200	-	36,259
Michigan	59,202	950	13,452	881	0	74,485
Minnesota	18,449	84	11,572	829	*	30,954
New Hampshire	3,691	1,368	-	975	-	6,034
New Jersey	8,571	8,261	17,770	-247	-	34,355
New York	18,811	42,951	24,092	26,956	*	111,782
Rhode Island	0	547	-	0	-	547
Vermont	39	14	2,999	852	280	4,185
Wisconsin	27,663	177	10,979	2,288	88	41,195
Total Downwind North	175,080	88,905	106,999	35,698	428	406,103
Upwind South						
Arkansas	20,275	965	9,889	4,434	-	35,565
Florida	43,525	29,204	23,461	244	0	96,434
Louisiana	13,968	27,836	2,457	-	-	44,261
Mississippi	10,015	4,838	4,332	-	-	19,185
North Carolina	50,845	253	19,303	4,091	*	74,492
South Carolina	19,814	129	31,826	1,786	-	53,555
Virginia	17,811	1,152	22,303	818	-	42,084
Total Upwind South	176,253	64,377	113,571	11,373	0	365,576

Table 6 (continued)
Net Generation at Electric Utilities by Region Division, State and Fuel Type: 1985
(Gigawatthours)

Region Division and State	Coal-Fired Steam	Petroleum and Gas	Nuclear	Hydro-Electric	Other	Total Net Generation
West						
Arizona	29,076	4,049	1,130	13,972	-	48,227
California	-	67,185	19,729	31,717	9,215	127,846
Colorado	26,128	356	-32	2,357	3	28,812
Idaho	-	3	-	10,863	-	10,866
Kansas	21,917	1,730	3,856	9	*	27,512
Montana	8,465	74	-	10,175	60	18,773
Nebraska	10,232	127	4,134	1,441	-	15,934
Nevada	11,642	759	-	4,344	-	16,746
New Mexico	24,260	2,720	-	128	-	27,108
North Dakota	19,873	25	-	2,173	*	22,071
Oklahoma	20,430	19,729	-	3,980	-	44,139
Oregon	592	-7	6,911	40,752	0	48,248
South Dakota	2,513	8	-	5,301	-	7,822
Texas	98,058	118,752	-	1,401	300	218,510
Utah	14,229	54	-	1,019	110	15,411
Washington	7,884	13	8,038	76,923	282	93,140
Wyoming	34,509	81	-	1,068	3	35,661
Total West	329,808	215,658	43,766	207,623	9,973	806,826
Eastern Coal	693,028	14,308	119,352	25,690	281	880,323
Downwind North	175,080	88,905	106,999	35,698	428	406,103
Upwind South	176,253	64,377	113,571	11,373	0	365,576
West	329,808	215,658	43,766	207,623	9,973	806,826
U.S. Total	1,401,832	382,241	383,688	280,384	10,682	2,458,828

*Small nonzero number.

SOURCE: U.S. Department of Energy, Energy Information Administration, Electric Power Annual 1985 (Washington, D.C., July 1986).

Table 7

Incidence of Electricity Fee with Different Exemptions: 1985

(percent of national total)

Region Division and State	Total Electricity	Total Electricity Minus Nuclear	Total Electricity Minus Nuclear and Hydro-Electric	Coal Only
Eastern Coal				
Alabama	2.96	2.81	2.87	3.67
Georgia	3.29	3.41	3.79	4.84
Illinois	4.22	3.11	3.59	4.50
Indiana	3.19	3.78	4.35	5.55
Kentucky	2.56	3.04	3.35	4.27
Maryland	1.31	1.08	1.16	1.26
Missouri	2.33	2.38	2.58	3.29
Ohio	4.50	5.24	6.05	7.71
Pennsylvania	5.49	5.24	6.01	7.14
Tennessee	2.71	2.74	2.81	3.59
West Virginia	3.23	3.83	4.41	5.63
Total Eastern Coal	35.80	36.67	40.96	51.45
Downwind				
North				
Connecticut	1.03	0.60	0.68	0.13
Delaware	0.34	0.41	0.47	0.42
Iowa	0.95	1.04	1.15	1.45
Maine	0.37	0.18	0.12	*
Massachusetts	1.47	1.45	1.67	0.75
Michigan	3.03	2.94	3.35	4.23
Minnesota	1.26	0.93	1.03	1.32
New Hampshire	0.25	0.29	0.28	0.26
New Jersey	1.40	0.80	0.94	0.61
New York	4.55	4.23	3.38	1.27
Rhode Island	0.02	0.03	0.03	0.00
Vermont	0.17	0.06	0.02	*
Wisconsin	1.68	1.46	1.56	1.97
Total Downwind North	16.52	14.42	14.68	12.42
Upwind South				
Arkansas	1.45	1.24	1.18	1.45
Florida	3.92	3.52	4.05	3.11
Louisiana	1.80	2.01	2.33	1.00
Mississippi	0.78	0.72	0.83	0.71
North Carolina	3.03	2.66	2.85	3.63
South Carolina	2.18	1.05	1.11	1.41
Virginia	1.71	0.95	1.06	1.27
Total Upwind South	14.87	12.14	13.41	12.58

Table 7 (continued)
Incidence of Electricity Fee with Different Exemptions: 1985
(percent of national total)

Region Division and State	Total Electricity	Total Electricity Minus Nuclear	Total Electricity Minus Nuclear and Hydro-Electric	Coal Only
West				
Arizona	1.96	2.27	1.85	2.05
California	5.20	5.21	4.26	0.00
Colorado	1.17	1.39	1.48	1.87
Idaho	0.44	0.52	0.00	0.00
Kansas	1.12	1.13	1.31	1.56
Montana	0.76	0.09	0.48	0.60
Nebraska	0.65	0.57	0.58	0.73
Nevada	0.68	0.81	0.69	0.83
New Mexico	1.10	1.31	1.50	1.73
North Dakota	0.90	1.06	1.11	1.42
Oklahoma	1.80	2.13	2.24	1.46
Oregon	1.96	1.99	0.03	0.04
South Dakota	0.32	0.38	0.14	0.18
Texas	8.89	10.53	12.10	7.00
Utah	0.63	0.74	0.80	1.02
Washington	3.79	4.10	0.46	0.56
Wyoming	1.45	1.72	1.93	2.46
Total West	32.81	36.77	30.95	23.54
Eastern Coal	35.80	36.67	40.96	51.45
Downwind North	16.52	14.42	14.68	12.42
Upwind South	14.87	12.14	13.14	12.58
West	32.81	36.77	30.95	23.54
U.S. Total	100.00	100.00	100.00	100.00

*Small nonzero number.

SOURCE: U.S. Department of Energy, Energy Information Administration, Electric Power Annual 1985 (Washington, D.C., July 1986).